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EXAMINER

STEELE, AMBER D

ART UNIT	PAPER NUMBER
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1639

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/510,744	Applicant(s) KWON ET AL.	
	Examiner AMBER D. STEELE	Art Unit 1639	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 57-68, 73, 75, and 78 is/are pending in the application.
- 4a) Of the above claim(s) 57, 62-68, 73, and 78 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 58-61 and 75 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

1. Claims 1-56 were canceled and new claims 57-84 were added in the preliminary amendment to the claims received on October 12, 2004.

The amendment to the claims received on June 1, 2009 amended claims 58-60 and 75 and canceled claims 69-72, 74, 76, 77, and 79-84.

Claims 57-69, 73, 75, and 78 are currently pending.

Claims 58-61 and 75 are currently under consideration.

Election/Restrictions

2. Applicants elected, without traverse, Group II in the reply filed on April 2, 2008. Claims 57, 62-68, 73, and 78 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim.

Priority

3. The present application claims status as a 371 national stage application of PCT/KR02/00617 filed April 9, 2002.

Specification

4. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Invention as Claimed

5. A method of bioconversion in organic solvent system using a β -galactosidase which comprises the steps of (a) preparing a vector for displaying on the spore surface comprising a

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gene construct from pCrylp-CMCase-hp and a gene encoding the β -galactosidase, wherein, when expressed, the gene construct expresses the display motif and the β -galactosidase in a fusion form, displaying on its surface, (b) transforming a host cell with the vector for displaying on the spore surface, (c) displaying the β -galactosidase on the spore surface of the host cell with noncovalent bond, (d) recovering the spore displaying the β -galactosidase on its surface, and (e) performing the bioconversion reaction in organic solvent system using the spore displaying the β -galactosidase on its surface and variations thereof.

Biological Deposit

6. The present invention requires pCrylp-CMCase-hp or part of pCrylp-CMCase-hp. Therefore, a biological deposit for pCrylp-CMCase-hp is required. See MPEP § 2403 and 37 CFR 1.802.

Withdrawn Objection

7. The objection to claims 58, 59-61, 69-72, 74-77, 79, and 82-84 regarding the dependency and the virus limitations is withdrawn in view of the claim amendments received on June 1, 2009.

New Objections

Claim Objections

8. Claims 58-61 and 75 are objected to because of the following informalities: “in organic solvent system” should be “in an organic solvent system” (see preamble and method step e), “on its surface” should be “on the spore surface” or, more preferably, “which is displayed on the spore surface” (see method step a), “with noncovalent bond” should be “with a noncovalent bond” (see method step c), “on its surface” should be “on the spore surface” (see method steps d

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and e), “one or more stability” should be “one or more stabilities” (see claim 75), and “stability to dry” should be “stability to dryness” (see claim 75). Appropriate correction is required.

Withdrawn Rejections

9. The rejection of claims 74 and 84 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is withdrawn due to the cancellation of the claims.
10. The rejection of claims 58-61, 74-77, 79, and 82-84 under 35 U.S.C. 102(e) as being anticipated by Pan et al. WO 02/055561 (effective filing date of January 15, 2001) is withdrawn in view of the claim amendments received on June 1, 2009.
11. The rejection of claims 58-61, 69-72, 74, 79, and 82-84 under 35 U.S.C. 102(e) as being anticipated by Wang et al. U.S. Patent 7,175,983 filed November 2, 2001 is withdrawn in view of the claim amendments received on June 1, 2009.
12. The rejection of claims 58-61, 69-72, 74-75, 79, and 82-84 under 35 U.S.C. 103(a) as being unpatentable over Wang et al. U.S. Patent 7,175,983 filed November 2, 2001 and Short et al. U.S. Patent 6,806,048 (effective filing date of June 16, 1997) is withdrawn in view of the claim amendments received on June 1, 2009.
13. The rejection of claims 58-61, 69-72, 74-77, 79, and 82-84 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 4, 6, 10-12, 14-19, and

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28-29 of copending Application No. 10/466,208 is withdrawn in view of the ABN of the application.

New Rejections Necessitated by Amendment

Claim Rejections - 35 USC § 112

14. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

15. Claims 58-61 and 75 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. This is a **new matter** rejection. Applicants did not point out where support can be found for the claim amendments received on June 1, 2009. Applicants are respectfully reminded of the necessity to point out support in the originally filed specification for any claim amendments (see MPEP § 2163, section B).

16. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

17. Claims 58-61 and 75 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. One of skill in the art would not be able to determine the scope of the presently claimed invention. Method step (a) of independent claim 58 refers to “a

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gene construct from pCrylp-CMCase-hp". However, it is not clear if the full plasmid, part of the plasmid, or a single gene from the plasmid is required. If a single gene from the plasmid is required, then which gene is required by the present claims? In addition, the present specification does not provide a detailed map of pCrylp-CMCase-hp wherein all the genes of pCrylp-CMCase-hp are provided.

18. Claim 58 recites the limitation "the display motif" in line three of method step a. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claims 58-61 and 75 are rejected under 35 U.S.C. 103(a) as being obvious over Pan et al. WO 02/055561 (effective filing date of January 15, 2001) and Wang et al. U.S. Patent 7,175,983 filed November 2, 2001.

The applied reference has common inventors (Pan, Choi, and Jung) with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which

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corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

For present claims 58-61, Pan et al. teach methods of bioconversion using a biocatalyst comprising (a) preparing a vector comprising pCrylp-CMCase and lipase or carboxymethylcellulase (b) transformaing a host cell including *Bacillus* species harboring a spore with a vector containing a gene encoding the biocatalyst including lipase and carboxymethylcellulase, (c) displaying lipase or carboxymethylcellulase on the spore surface via noncovalent bonds, (d) recovering the biocatalyst/spore complex, and (e) performing a bioconversion reaction in organic solvent (please refer to the entire specification particularly the abstract; pages 5, 8-10, 12-26, and 27-32).

For present claim 75, Pan et al. teach biocatalysts exhibiting enhanced thermal, pH, organic solvent, and dry stability; spores with lower or no protease activity (please refer to the entire specification particularly pages 19, 24, 26, 30-32).

However, Pan et al. does not teach β -galactosidase.

For present claims 58-61, Wang et al. teach methods of surface displaying polypeptides on spores including *Bacillus* species via (a) transforming a host cell harboring a spore (i.e. genetic carrier) with a vector containing a gene encoding a biocatalyst, (b) culturing the

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transformed host cell and expressing the biocatalyst in the host cell, (c) allowing the formation of noncovalent bonds between the expressed biocatalyst and the surface of the spore so that the biocatalyst is displayed on the surface of the spore, (d) recovering the genetic carrier, and (e) detecting the biocatalyst via performing a bioconversion reaction (please refer to the entire specification particularly the abstract; columns 4-5, 13-14, 18, 22-23, 27-30, 33-36, 38). In addition, Wang et al. teach that β -galactosidase can be displayed on the spore surface (please refer to the entire specification particularly the paragraph spanning columns 33-34).

The claims would have been obvious because the substitution of one known element (i.e. lipase and carboxymethylcellulase taught by Pan et al.) for another (i.e. β -galactosidase taught by Wang et al.) would have yielded predictable results to one of ordinary skill in the art at the time of the invention. See *KSR International Co. v. Teleflex Inc.*, 82 USPQ 2d 1385 (U.S. 2007).

21. Claims 58-61 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. U.S. Patent 7,175,983 filed November 2, 2001; Short et al. U.S. Patent 6,806,048 (effective filing date of June 16, 1997); and Bravo et al. U.S. Patent 6,096,306 (effective filing date of July 2, 1998).

For present claims 58-61, Wang et al. teach methods of surface displaying polypeptides on spores including *Bacillus* species via (a) transforming a host cell harboring a spore (i.e. genetic carrier) with a vector containing a gene encoding a biocatalyst, (b) culturing the transformed host cell and expressing the biocatalyst in the host cell, (c) allowing to form noncovalent bonds between the expressed biocatalyst and the surface of the spore so that the biocatalyst is displayed on the surface of the spore, (d) recovering the genetic carrier, and (e)

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detecting the biocatalyst via performing a bioconversion reaction (please refer to the entire specification particularly the abstract; columns 4-5, 13-14, 18, 22-23, 27-30, 33-36, 38). In addition, Wang et al. teach that β -galactosidase can be displayed on the spore surface and utilized to facilitate detection (please refer to the entire specification particularly the paragraph spanning columns 33-34).

However, Wang et al. does not teach altered stability of the biocatalyst.

For present claim 75, Short et al. teach methods of identifying clones including clones with surface displayed proteins via assaying for a specified activity of interest including β -galactosidase and assaying for increased stability particularly to heat or organic solvents (please refer to the entire specification particularly column 26, lines 26-35).

While it is not clear what “gene construct from pCrylp-CMCase-hp” requires (see claim 58, method step b), it does not appear that Wang et al. or Short et al. disclose a “gene construct from pCrylp-CMCase-hp”. It is noted that pCrylp-CMCase-hp utilizes the cry1Aa promoter.

For present claims 58-61 and 75, Bravo et al. teach utilizing a cry1Aa promoter isolated from *Bacillus thurigiensis* to express proteins in *Bacillus* (please refer to the entire specification particularly Figure 2 and Example 3).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the teachings of Wang et al. with assaying for enhanced heat or organic solvent stability.

One having ordinary skill in the art would have been motivated to do this because Short et al. teach methods to identify clones expressing polypeptides having a specific activity of interest (e.g. galactosidase, oxidoreductase, transferase, hydrolase, lyase, isomerase, ligase, etc.

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activity) wherein surface display of the polypeptides is utilized in the assay and random mutagenesis is utilized to create a diverse library including mutations that provide greater stability to heat and organic solvents (please refer to the entire specification particularly the abstract; column 6, lines 27-61; column 15, lines 26-47; column 16, lines 62-65; column 20, lines 30-36; column 26, lines 26-35 and lines 60-67; column 27, lines 13-21). In addition, Wang et al. teaches methods of utilizing adaptors to noncovalently bind polypeptides of interest to spores to provide added flexibility for the presentation and/or selection of proteins thus avoiding drawbacks including high toxicity, limitations on orientation, instability, etc. (please refer to the entire specification particularly column 3, lines 32-67).

One of ordinary skill in the art would have had a reasonable expectation of success in the modification of the teachings of Wang et al. with the specific polypeptides to be displayed and the mutagenesis strategy utilized in order to find polypeptides with enhanced heat or organic solvent stability because of the examples provided by Short et al. (see Examples 1-6) and Wang et al. (see Examples 1-6).

In addition, the claims would have been obvious because the substitution of one known element (i.e. promoters taught by Wang et al.) for another (i.e. cry1Aa promoter taught by Bravo et al.) would have yielded predictable results (i.e. initiation of transcription, subsequent translation of polypeptides contained in vector) to one of ordinary skill in the art at the time of the invention. See *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (U.S. 2007).

Therefore, the modification of the teachings of Wang et al. with the specific polypeptides to be displayed and the mutagenesis strategy utilized in order to find polypeptides with enhanced

heat or organic solvent stability taught by Short et al. with the specific promoter taught by Bravo et al. render the instant claims *prima facie* obvious.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Future Communications

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMBER D. STEELE whose telephone number is (571)272-5538. The examiner can normally be reached on Monday through Friday 9:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christopher Low can be reached on 571-272-0951. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Amber D. Steele/
Primary Examiner, Art Unit 1639

August 3, 2009